

cules is strongly insisted on throughout this book. When we know nothing of these relations the author does not hesitate to tell us so. Thus, regarding the formula of benzene, as commonly written with successive double and single bonds, he says (p. 239):—"This formula, however, expresses something about which we know nothing, and concerning which it is difficult at present to form any conception. The simpler formula [*i.e.* the hexagon without any double bonds] leaves the question as to the relation between the carbon atoms entirely open, as it is in fact." And again, speaking of the structure of the molecule of ethylene, Prof. Remsen remarks (p. 213):—"As regards the relations between the two carbon atoms of ethylene we know nothing, save that it is probably different from that which exists between the carbon atoms of ethane."

A most instructive example of the methods pursued in organic chemistry, and at the same time of the scientific method of inquiry, is to be found on pp. 318-321, where the reactions of phenol-phthalein are discussed. The facts are given, but they seem only facts until some light is shed on them by the appearance in one reaction of triphenylmethane, a substance already familiar to the student. The student is shown how "this suggests that all the substances [he has been examining] are derivatives of this fundamental hydrocarbon." And he is asked to note how easily, when this conception has once been formed, the interpretation of all the reactions follows.

Many other admirable illustrations of the scientific method of inquiry are to be found throughout the book. I would especially draw attention to the simple but thoroughgoing treatment of the "equivalency of the hydrogen atoms" in the molecule CH_4 (pp. 28-29), and in the molecule C_6H_6 (pp. 234-236). It is on subjects such as are discussed in the pages referred to that the chemical student so frequently suffers shipwreck. If he will use this little book by Prof. Remsen as his pilot, and will keep a good look out as he proceeds, he may hope to pass the shoals of the hexagon-formula, and the shallows of the ortho-, meta-, and para-derivatives of benzene.

The author of this book deserves the thanks of all chemical teachers who have tried to teach organic chemistry to beginners for the clear and short directions which he gives for preparing the more important compounds of carbon. The book may well be used as a laboratory guide, no less than as an introduction to the science of organic chemistry.

Prof. Remsen has already done good service to the science of which he is a student, by publishing his "Principles of Theoretical Chemistry;" he has now given us a book which must be of great use in advancing the study of organic chemistry; could he not supplement these by an elementary but scientific treatise on inorganic chemistry?

M. M. PATTISON MUIR

MINERALOGY IN CALIFORNIA

Fourth Annual Report of the State Mineralogist of California. By H. G. Hanks. 8vo, pp. 410. (Sacramento: State Printer.)

ALTHOUGH a systematic geological investigation of the State of California has been commenced at different times since 1853, the Legislature has generally got

tired of providing the funds after a few years' continuance, and the work has been stopped. The most notable effort towards the provision of a complete geological description of the State was that made by Prof. J. D. Whitney, who, with a body of assistants, including men of the highest attainments in every collateral branch of natural science, carried on the survey from 1860 to 1873, when it was suddenly discontinued, to the great regret of scientific men both in America and Europe. No attempt to continue or supplement Prof. Whitney's work was made until 1880, when the author was appointed State mineralogist with the object of investigating questions more particularly connected with mining industry than with geology in the larger sense. The author during his period of office, which appears to be terminable and held for four years only, has founded a valuable mineral museum and library, more than 6000 specimens illustrative of the mineral deposits of the State having been collected and arranged. These do not, however, appear to be very sumptuously housed, as the author calls attention to the danger from fire, "as well as other inconveniences, such as the prevalence of ammoniacal and hippuric odours, and the disturbance of arranged specimens in the cases by the jarring made by the hoisting of hay by tackles attached to the underside of the museum floor. The California State Museum is well worthy of a good and thoroughly fireproof building." With the latter opinion our readers will no doubt heartily agree.

Besides the work of organising the museum the author has published annually a report upon some branch of mineral industry as carried out in the State—for instance, that for 1883 was largely devoted to the borax deposits of the mud lakes in the interior of the State. The present volume, described as the fourth and last report of the State mineralogist, is mainly devoted to a catalogue and description of the minerals of California as far as they are yet known. This is alphabetically arranged, and contains descriptions of the composition physical properties and uses of the different species, together with detailed information as to localities, and methods of working in the more important ones. Altogether 161 different species are described as having been found in California, but this number will no doubt be considerably increased by future explorers. At the present time, in addition to gold; mercury, petroleum, and borax are the chief products of importance, although as regards all of them the prevailing complaints of over-production and unremunerative prices appear to be as prevalent as in less favoured localities in the Old World. The condition of the gold-mining industry appears to be a very healthy one, for although the enormous annual yield, ranging from 10 to 13 millions sterling in 1850-55, has diminished to 3 and 4½ millions in the past four years; the increased facilities for working render it possible to handle at a profit rock not containing more than 12s. worth of gold in the ton; while in the earlier days 20 dollar (80s.) rock was not considered to be worth removal. The total value of the gold raised in California since 1848 is estimated at above 230,000,000*l.* in value, which if reduced to a single mass would be contained in a cube 14 feet 4 inches in the side.

Although the work is essentially a compilation, it is well arranged, and will be of great use to those interested in Californian minerals. A general introduction on the

resources and industries of the State precedes the catalogue of minerals. This, though interesting matter, seems rather out of place.

H. B.

ALGÆ

Rabenhorst's Kryptogamen-Flora von Deutschland, Oesterreich, und der Schweiz. Zweiter Band. Die Meeresalgen. Bearbeitet von Dr. F. Hauck. Nos. 7, 8, 9, 10. 8vo. (Leipzig: Ed. Kummer, 1883-1885.)

A Monograph of the Algæ of the Firth of Forth. By George William Traill. 4to. (Edinburgh: Printed for the Author, 1855.)

Notes on Marine Algæ. By Edw. Batters, F.L.S. (*Proceedings of the Berwickshire Naturalist Club*, 1884.)

THE concluding numbers of Dr. Hauck's work have recently appeared. To the description of species is added an appendix in which some new species are described. Then follow a comprehensive key to the genera; an index of families, genera, species, and synonyms; lists of illustrations, and of works on algæ, arranged alphabetically, according to the names of the authors; also the title-page, preface, and table of contents—all most useful auxiliaries to a scientific work.

To the favourable opinion of this work, already expressed in the columns of NATURE (vol. xxix. p. 341), it may be added that the later numbers, treating of the Chlorozoosporeæ and the Schizophyceæ, fully justify this opinion, and Dr. Hauck must be congratulated on the successful completion of what has undoubtedly been an arduous undertaking.

In turning over the pages of the work, one cannot but be struck by the variety of views which, in spite of the closest examination by competent observers with the aid of the best microscopes, still prevail among algologists as to the systematic position of certain algæ.

Not to multiply instances, it will be sufficient to mention the genera *Porphyra* and *Bangia*. By Dr. Berthold and Dr. Hauck they are classed with the Floridæ; while Dr. Agardh and M. Rosanoff place them among the Ulvaceæ. As to *Goniotrichum*, which Dr. Agardh relegates to the Ulvaceæ and Dr. Berthold includes in the Bangiaceæ, Dr. Hauck, in despair of discovering its affinities, places it at the end of the description of species, as of still doubtful position.

Although it may be doubted whether all Dr. Hauck's identifications of British Algæ will be admitted by our botanists, yet the work cannot fail to prove extremely useful in this country, and is, in fact, much needed.

Mr. Traill's work, entitled "A Monograph of the Algæ of the Firth of Forth," consists of an alphabetical list of the marine Algæ of this locality, with their habitats, time of appearance and of fruiting, and the names of the host-plants on which grow such species as are epiphytic. Each copy of the work is intended to be illustrated with some half-dozen herbarium specimens of the rarer Algæ. Those in the copy before the writer are in excellent condition, and are interesting from their rarity.

That Mr. Traill is a most patient and painstaking observer goes without saying. An analysis of the list will show how many species he has collected and observed, which are new, not only to the Firth of Forth, but to the British marine flora. He has watched the growth

and development of these plants from their first appearance until their maturity. Among them will be found several Algæ which, though frequent in the south, have not previously been seen so far north; and he has also met with some arctic and northern species which are not only new to the British marine flora, but are not described in Dr. Hauck's work.

Among these northern species may be mentioned *Phleospora tortilis*, which has a range in this country, so far as is known at present, from the Firth of Forth to Bamborough. While this plant is so abundant in the Baltic as to cause much inconvenience to fishermen by getting entangled in their nets, its existence is not recorded on the German shore of the North Sea. *Urospora penicilliformis*, one of the Algæ found by Dr. Kjellman on the coast of Spitzbergen, is another of Mr. Traill's "finds."

It will be observed that he mentions having obtained the cystocarps of *Rhodomenia palmata*. If he has really met with the true cystocarps of this plant he is fortunate, since Dr. Agardh, Dr. Harvey, Dr. Hauck, and other botanists have hitherto searched for them in vain. Harvey has shown ("Phyc. Brit.," Pl. 217) that bodies outwardly resembling cystocarps are common enough; probably these are what Mr. Traill has found. They are not, however, true cystocarps.

The establishment of the Biological Station at Granton, near Edinburgh, will certainly give a fresh impetus to the study of marine botany in that locality; and there is no doubt that Mr. Traill's work will be found extremely serviceable to local collectors of Algæ.

The *Proceedings* of the Berwickshire Naturalist Club for 1884 contain notes by Mr. Edward Batters on seventeen species of rare and little known Algæ found by him at Berwick-upon-Tweed. A short and clear description is given of each species, and the rarer kinds are illustrated by lithographic plates.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.]

Ocular After-Images and Lightning

It will no doubt be of interest to many of your readers to know that the curious optical phenomenon observed by Prof. C. A. Young, when working with a large Holtz machine, and referred to in Mr. Newall's letter (NATURE, vol. xxxii. p. 77), may be produced with very small apparatus.

I have in my possession one of the small Voss machines with 10-inch plates which are now so common. Upon the stand of this instrument I placed two ordinary Leyden jars, about 5½ inches high, in such a position that their tinfoil-covered bottoms touched the brass sockets in which rest the fixed condensers of the machine, while the rods connected with their inner coatings were in contact with the sliding electrodes; with this arrangement sparks of great brilliancy from 1½ to 2 inches in length could easily be produced at the rate of about six per minute. A copy of NATURE was set up against a dark background 4 feet distant from the machine, and at every discharge the paper appeared to be illuminated by two, or sometimes three, distinct flashes of decreasing brightness, which succeeded one another with great rapidity. Each flash was sufficiently